DOCUMENT RESUME

ED 089 704 IR 000 416

TITLE	Specifications for the Microfilming of Books and Pamphlets in the Library of Congress.
INSTITUTION	Library of Congress, Washington, D.C. Photoduplication Service.
PUB DATE	73
NOTE	22p.
AVAILABLE FROM	Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402 (Stock No. 3000-00068, $0.40)
EDRS PRICE	MF-$0.75 HC-$1.50 PLUS POSTAGE
DESCRIPTORS	*Books; *Microreproduction; *Pamphlets; *Specifications; *Standards
IDENTIFIERS	*Library of Congress

ABSTRACT

The procedural and technical changes in the Library's photoreproduction methods adopted since 1964 (when "Specifications for Library of Congress Microfilming" was published) are embodied in this publication. In drawing up separate specifications for the several different bibliographic groups, the Photoduplication Service intends to place special emphasis on the definition of criteria regularly employed to evaluate microfilms under consideration as additions to the Library's permanent collections. No attempts is made to cover every problem which may arise or to provide final answers to questions still controversial. Sections of the publication are as follows: 1) Preparation; 2) Technical Guide; 3) Filming Procedures; 4) Processing the Exposed Film; 5) Inspection of the Film; 6) Intermediate Copies; 7) Research Use Copies; 8) Storage; 9) Glossary; 10) Selected References. Reference is made to applicable standards approved by the American Standards Association and its successor, the American National Standards Institute. Parallel recommendations, as far as published on the international level by the International Organization for Standardization, are available at the same address. (JB)

ED 089704

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SPECIFICATIONS for the MICROFILMING of BOOKS and PAMPHLETS in the LIBRARY of CONGRESS

IR 000 476

ED 089704

Specifications for the Microfilming of Books and Pamphlets in the Library of Congress

Prepared by the Photoduplication Service

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Library of Congress Washington 1973

Library of Congress Cataloging in Publication Data

United States. Library of Congress. Photoduplication Service.
Specifications for the microfilming of books and pamphlets in the Library of Congress.

1. Microphotography. 2. Books on microfilm. I. Title.
Z265.U48 686.43 73-9756
ISBN 0-8444-0098-X

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price 40 cents
Stock Number 3000-00068

PREFACE

This publication embodies the procedural and technical changes in the Library's photoreproduction methods adopted since 1964, when *Specifications for Library of Congress Microfilming* was published. It is hoped that this additional guide will clarify recommended procedures for the filming of monographs and pamphlets, as the 1972 publication, *Specifications for the Microfilming of Newspapers in the Library of Congress*, was designed to do for newspapers. In drawing up separate specifications for the several different bibliographic groups, the Photoduplication Service intends to place special emphasis on the definition of criteria regularly employed to evaluate microfilms under consideration as additions to the Library's permanent collections. No attempt is made to cover every problem which may arise or to provide final answers to questions still controversial.

This guide is limited to the microfilming of monographs, which are defined here as in the latest edition of *Anglo-American Cataloging Rules* (Chicago: American Library Association, 1967): "A work, collection, or other writing that is not a serial."

Special credit for writing this specification is due to Sidney N. Blake, Clarence H. Cohen, William E. Davis, Elmer S. King, Joseph A. Sigona, Paul A. Solandt, Roy J. Yeager—all of the Photoduplication staff—as well as other Library staff members in the Processing and Reference Departments and in the Preservation Office.

Reference is made to applicable standards approved by the American Standards Association and its successor, the American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018. Parallel recommendations, as far as published on the international level by the International Organization for Standardization, are available at the same address.

Charles G. LaHood, Jr., *Chief*
Photoduplication Service

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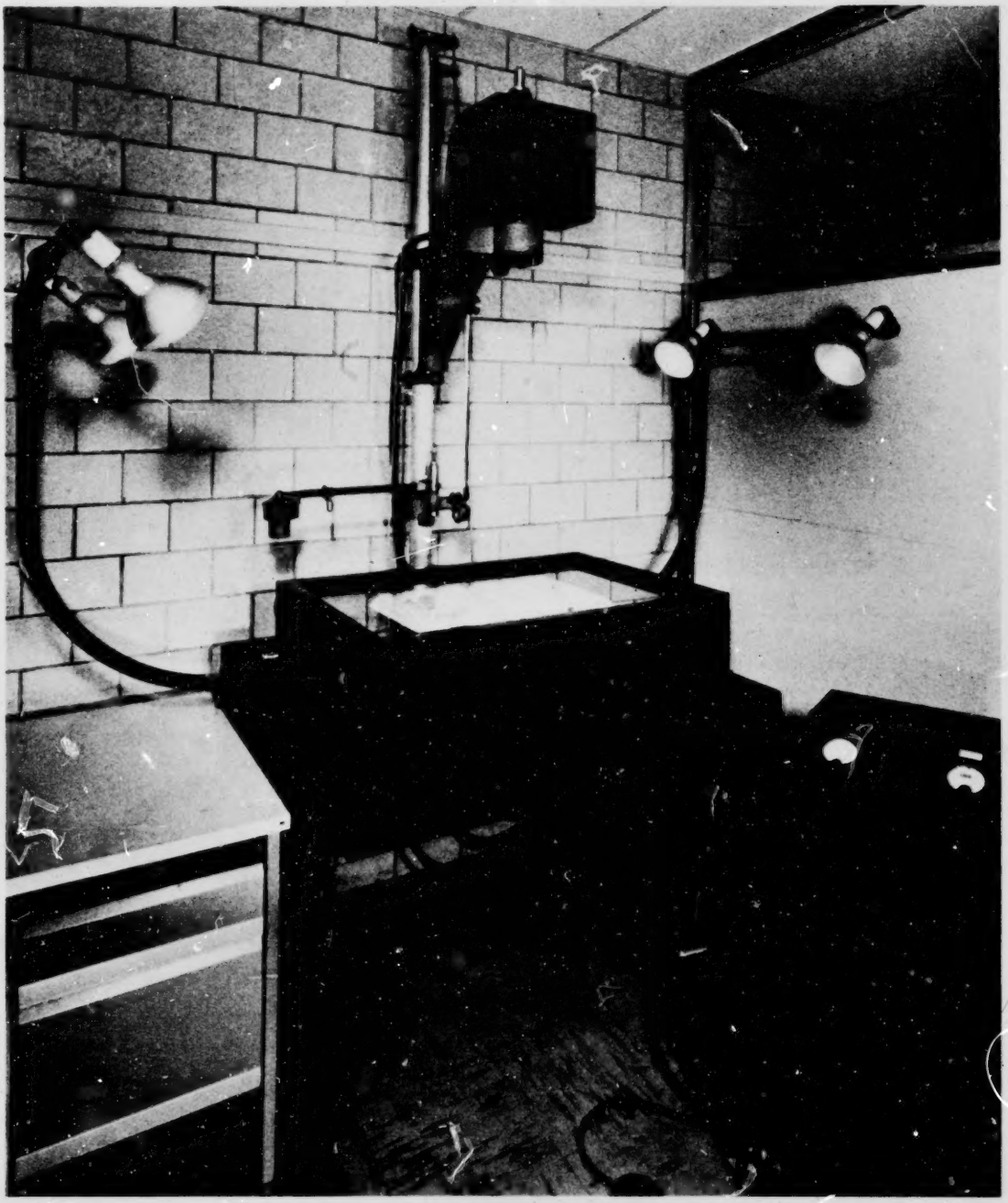


Figure 1

Microphotographer's station, equipped with book cradle. Note book under glass plate which holds pages in focal plane.

1. PREPARATION

1.1 Preliminary Collation

The entire book or pamphlet shall be collated before filming, page by page, and a complete list made of:

a. all missing pages and plates, and those out of order;

b. all imperfections, such as mutilations, tears, stains, obliterations, and missing portions. Imperfections which do not affect any text or illustration may be ignored.

1.2 Completion of the text

Every effort shall be made to obtain missing pages and replacements for mutilated pages before submitting the item to the microphotographer for filming. Major research libraries and other libraries likely to have the needed material shall be contacted in an attempt to locate copies of the missing portions. If located, the material must be acquired, permanently or on loan, and inserted in the proper sequence. When this is not possible, microfilm made to the same specifications as those used for the basic volume shall be ordered from the institution concerned and later spliced into the LC negative. To avoid distortion or loss of text in the gutter of the volume, it is preferred that tight bindings be removed to permit photoduplication of the entire content. If the integrity of the original text may be jeopardized by the removal of bindings, it is recommended that they be loosened; if this cannot be done, every effort must be made to minimize textual loss and to achieve the best possible copy. When pages or plates are out of order, and when it is possible to remove the bindings, rearrangement of the material into correct sequence before filming should be considered. If removal of the bindings is not practical, the question should be raised whether the item should be filmed "as is," or whether the sequence should be corrected during the filming process.

All pages of the material shall be filmed including any blank pages which figure in consecutive pagination whether actually numbered or not, but usually not including blank leaves inserted at the back or front of a volume, and not included in any pagination. It is possible, however, that these blank endpapers must be filmed if a detailed collation shows that they may serve as essential evidence to establish the authenticity of a volume, or to prove the identity of one of several editions.

1.3 Final Collation

Final collation and revision of the original item are essential before the start of filming. The complete target series outlined below (see section 2.2, Targets) must agree with this final collation in every detail, accounting for all parts included as well as noting any special circumstances in the original, such as portions and plates missing, or any physical irregularities. All targets must be made ready and inserted in the sequence before filming begins; specifically, not only those "constant" targets which are standard at the beginning and end of every item, or every reel, but also the "as needed" targets to be inserted throughout the sequence as the particular circumstances require.

2. TECHNICAL GUIDE*

2.1 Special Considerations

Although problems due to creases and wrinkles arise rarely in the case of monographs, the scattered instances of such problems cannot be ignored. No strict procedures are recommended; experienced laboratory technicians devise solutions for each case as circumstances dictate. A thin sheet of stiff backing material inserted under the page to be filmed is often adequate.

Pages stuck together must be handled with extreme

*Illustrative examples in the several "figures" of this pamphlet are not drawn to scale.

caution. It is often possible to steam them apart, and, if they are not to be filmed immediately, sheets of nonadhesive material such as silicone-treated paper can be inserted between the pages to prevent further sticking.

In all such problems, if any of these prefilming treatments include elements of possible damage, particularly in the case of rare books or manuscripts, the item in question must be returned to its custodial division without filming in order that the division involved assume all responsibility for prefilming procedures of a remedial character, or for cancellation of the filming if such action seems in the best interests of preservation.

2.2 Targets

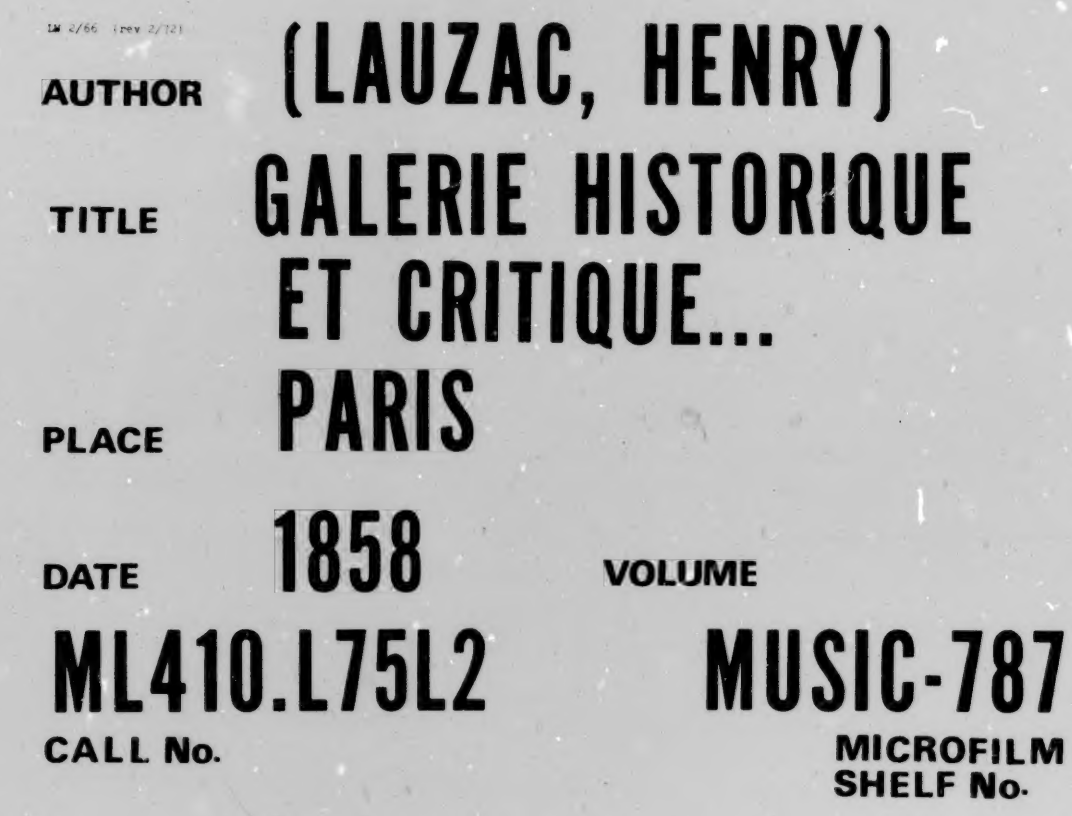
Film appropriate targets at the beginning and end of each publication, and at the beginning and end of each reel when more than one reel is needed. Film in addition the "as needed" targets throughout the film. Menu boards or titling sets are often used to make such targets (see figures 2-4).

The word "START" (figure 4, target 1) must appear in the first frame of any roll of film, and the word "END" (figure 4, target 15), in the last frame, in letters which produce images on film of at least 0.08 inch (2.032mm) high.

Following the "START" target and preceding the "END" target, there must be a bibliographic target to identify the publication filmed (figure 4, targets 2 and 14), giving the author, title, place of publication, date of publication, volume number when needed, and microfilm shelf number where appropriate (see figure 2). The height of the letters on the film in this primary bibliographic target shall also be at least 0.08 inch (2.032mm).

If the material covered by the primary bibliographic target extends over more than one reel, another bibliographic target indicating the contents of that particular reel shall be filmed immediately following the primary bibliographic target. Biblio-

Figure 2



graphic data abbreviated as necessary to fit macroscopic targets shall be in conformity with *Anglo-American Cataloging Rules* (Chicago: American Library Association, 1967), or the latest edition thereof.

A secondary bibliographic target consisting of a Library of Congress printed or typewritten catalog card and the Photoduplication Service credit sign (or other agency producing the microfilm) shall be filmed immediately after the primary target (figure 4, target 3). If another organization was instrumental in planning the project, that information may be given also.

Film the list of missing pages, mutilations, etc. (see section 1.3 above) as a separate frame or frames immediately after the bibliographic targets (figure 4, target 4). If the item is fragmentary, a list of the pages filmed may be used instead.

When filming a multi-volume monographic work, a target indicating each volume shall be filmed before the pages of the volume in question (figure 4, target 5).

Following the secondary bibliographic targets, a technical target is necessary. The technical target (figure 5) shall be an assembly of five National Bureau of Standards Microcopy Resolution Test Charts, 1010-1963A, and a 6-inch (or 150mm) paper scale, placed on a sheet of single-weight, non-glossy white paper as described below. The center resolution test chart shall be placed with the zero of the "10" pattern within 1/4 inch (6.350mm) of the center of the technical target, and with the lines of the test patterns parallel to the technical target edges. The corner test charts shall be positioned at the outermost points of the photographic field and oriented so that one edge of each chart is parallel to the diagonal of the technical target. The zero of the "10" pattern shall be within 1/4 inch (6.350mm) of the diagonal of the technical target. Depending upon the diameter or reduction ratio selected for filming, the resolution targets shall be placed in either a larger or smaller field as the document size dictates. The 6-inch (or 150mm) paper scale showing increments in both inches and millimeters shall be located under the center resolution test chart and centered on the vertical center line of the technical target. The technical targets shall be filmed on the same camera, at the same time, and under conditions which achieve the same reduction ratio as the text. To assure that this procedure has been followed, there shall be no splices between the technical targets and the adjacent 10 frames of text. These requirements apply equally to the technical targets at the beginning and end of the reel.

An indication of the reduction ratio used in the filming may also be given on one of the preliminary

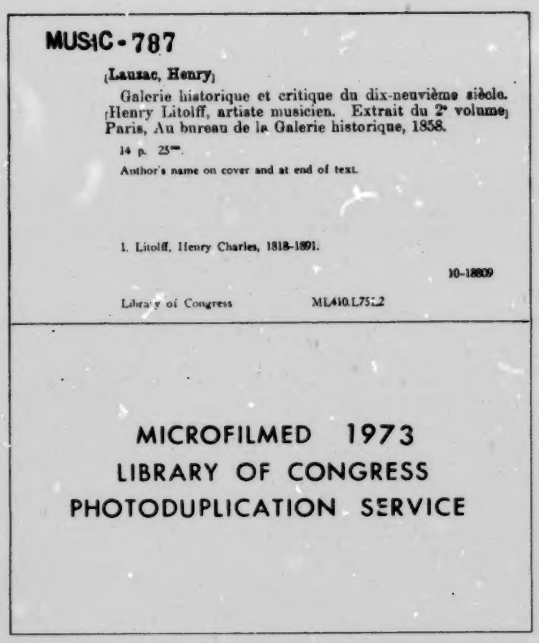

MUSIC-787
[Lauzac, Henry]
Galerie historique et critique du dix-neuvième siècle. [Henry Litolff, artiste musicien. Extrait du 2e volume] Paris, Au bureau de la Galerie historique, 1858.
14 p. 25cm.
Author's name on cover and at end of text.
1. Litolff, Henry Charles, 1818-1891.
10-18809
Library of Congress ML410.L75L2
MICROFILMED 1973
LIBRARY OF CONGRESS
PHOTODUPLICATION SERVICE

Figure 3

targets. This may be shown by filming at the same reduction ratio a section of an inch and millimeter scale, respectively, at least 3 inches (76.200mm) long; this will make possible a more accurate reconstruction of the size of the original material than would a simple statement of the reduction ratio (see figure 4, target 9). Any intervening change in reduction ratio requires the insertion of another such technical target with a ruler to show the amount of reduction or enlargement introduced.

Any of the following information must also be included on a target, when appropriate: location of the original material, a list of pages and illustrations filmed from other copies of the same title, reference to a separate index or to supplementary bibliographic data for the material being filmed, and note of any restrictions on further reproduction or use of the microfilm.

Insert targets to indicate any faults in the original so that they are not mistaken for errors in the filming. When a page is missing from the material being filmed, a space of 1 1/4 inches (31.750mm) to 2 inches (50.800mm) on the film shall be left blank to allow for splicing in missing material later. A target with the wording "page missing" or "pages missing," as appropriate, shall appear in the center of this space (figure 4, target 11).

Before a mutilated page, or if a book or pamphlet contains extensive mutilation, film a target in letters

1 START

2 [Lauzac, Henry]
Galerie historique et critique . . .
Paris 1858

3 [Lauzac, Henry]
Galerie historique et critique . . .
Paris 1858

MICROFILMED 1973
LIBRARY OF CONGRESS
PHOTODUPLICATION
SERVICE

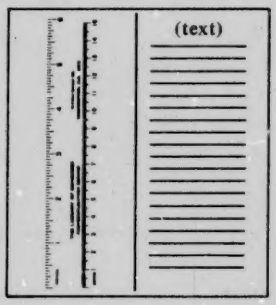
4 [Lauzac, Henry]
Galerie historique et critique . . .
Missing:
Mutilated:

5 (as needed)
[Lauzac, Henry]
Galerie historique et critique . . .
Vol. 2
Paris 1858

6 TECHNICAL TARGET
see figure 5

7 (as needed)
COPYRIGHT MATERIAL
NOT TO BE FURTHER REPRODUCED WITHOUT PERMISSION OF THE COPYRIGHT OWNER

8 (as needed)
BEST COPY AVAILABLE

9 

10 (as needed)
PAGINATION INCORRECT

11 (as needed)
PAGE(S) MISSING
NOT AVAILABLE

12 TECHNICAL TARGET
see figure 5

13 (as needed)
[Lauzac, Henry]
Galerie historique et critique . . .
. . . ol. 2
Paris 1858

14 [Lauzac, Henry]
Galerie historique et critique . . .
Paris 1858

15 END

Figure 4

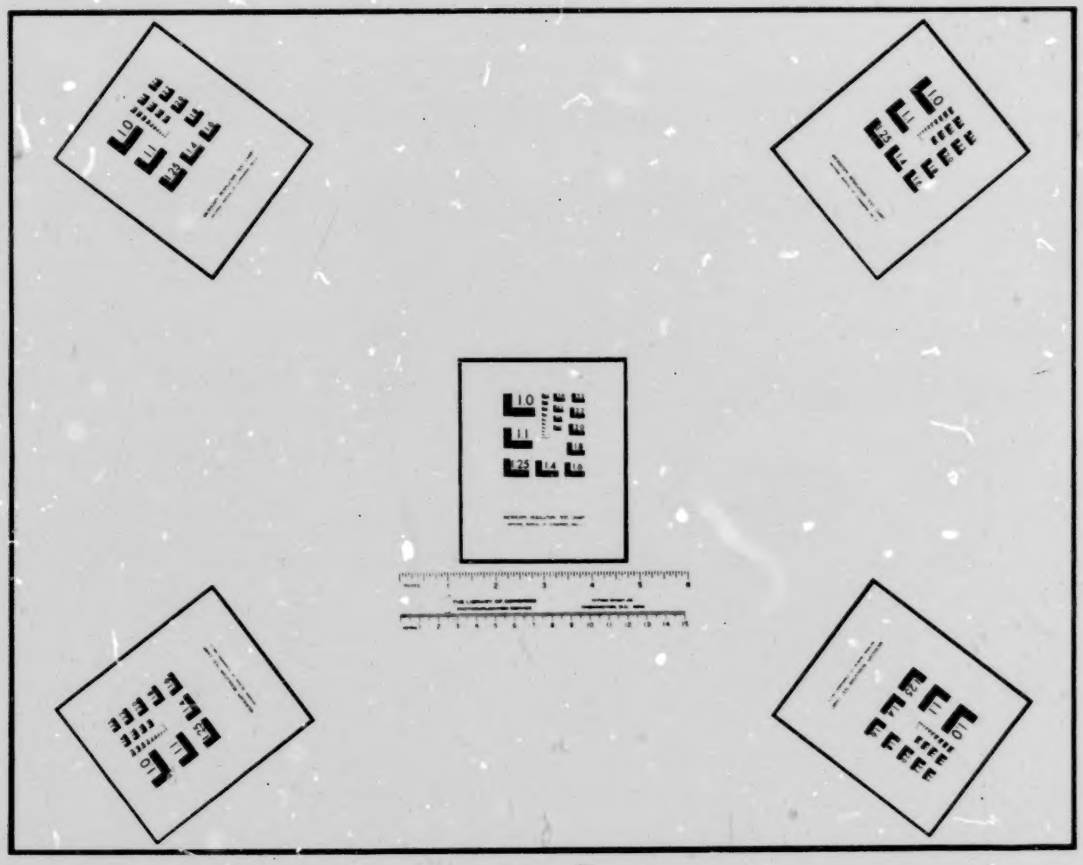


Figure 5 (not to scale)

which produce images on film of at least 0.08 inch (2.032mm) in height, indicating that the following page or pages were filmed from the "Best Copy Available"; this shall also be done for illegible pages or pages otherwise faulty in the original (see figure 4, target 8). Mutilations which do not affect any printing or illustrations may be ignored. If a page has been mutilated so that a portion has been lost, the page shall be backed up with a piece of white paper, both to reveal that a portion has been lost and to prevent the filming of the corresponding portion of the ensuing leaf in faulty sequence.

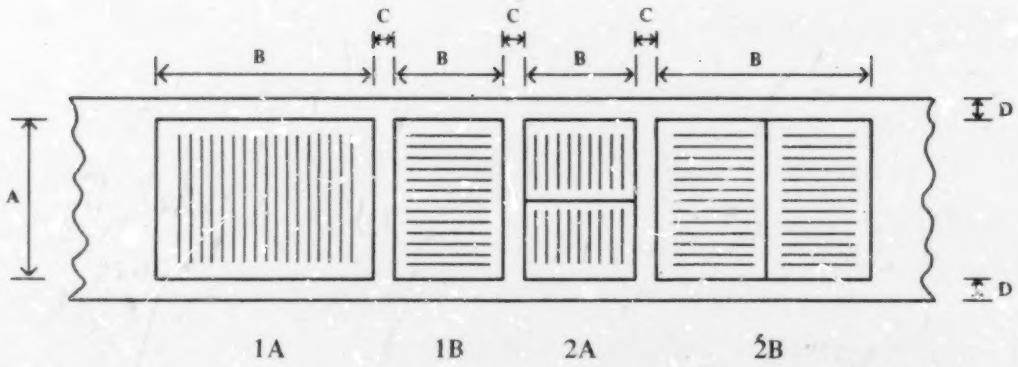
Use targets 7 and 10 in figure 4 for copyright and pagination, as necessary, in letters which produce images on film of at least 0.08 inch (2.032mm) high.

2.3 Image Placement and Reduction Ratios

The position of images and the reduction ratio for a particular monographic work depend on the dimensions, type size, and legibility of the original, and the use to be made of the negative.

The four types of image placement recognized by the *USA Standard, Specifications for 16mm and 35mm Silver-Gelatin Microfilms for Reel Applications, PH5.3-1967, Section 4*, are shown at the top of figure 6. The standard specifies that the maximum permissible width of the image area (dimension A in figure 6) is 1.3 inches (33.020mm) for unperforated 35mm film, and 0.944 inch (23.980mm) for the same width film perforated on both edges. Conversely, for dimension D, a minimum of 0.038 inch (0.965mm) is specified for unperforated 35mm film and 0.216 inch (5.486mm) for perforated film. Longitudinal image (dimension B) with the lines of text arranged at right angles to the edge of the film cannot normally be extended beyond approximately 1 3/4 inches (44.450mm) with most cameras and usually must be limited to the image area occupied by the material

Microfilm Position Chart



Positions 1A and 1B are single-page exposures; positions 2A and 2B are double-page exposures.

In positions 1A and 2A the text is perpendicular to the long axis of the film; in positions 1B and 2B the text is parallel to the long axis of the film.

For reference concerning microfilm positions, see USA Standard. Specifications for 16mm and 35mm Silver-Gelatin Microfilms for Reel Applications, PH5.3-1967, Section 4, or the latest revision thereof.

Guide to Maximum Reduction Ratios

Type size of original*: Letter height mm (lower case e)	(1-2mm)	3+mm
Maximum, Dimension A (unperf. film):	17″	[illegible]
Maximum, Dimension A (perf. film):	13″	18″
Maximum, Dimension B:	24″	34″
Maximum reduction ratio:	16x	20x

**For a discussion of type size, see William R. Hawken, Copying Methods Manual (Chicago, American Library Assn., LTP, 1966).*

Figure 6

being filmed. Dimension C shall be about 3/32 inch (2.381mm) or less. Although wider or closer spacing is allowable, it is generally advantageous to limit the interframe spacing in the interests of economy. The latter can be even better realized by the careful selection of image placement and reduction ratios. The work and its projected use must be evaluated together for optimum results, with due considerations for the capacities and limitations of the cameras, reading machines, reader-printers, etc., likely to be involved, and with special attention to compatibility.

Position 2A, as shown on the chart in figure 6, is preferred when the dimensions of the original and the type size allow it. Position 2B (the next choice) may require up to twice as much film as position 2A, as the chart indicates. (All pages shown are drawn to the same relative dimensions.) This means twice as much footage for each positive copy, of course, as well as for the negative. Position 1A (the third choice, and sometimes the only one possible) not only may require twice the film necessary for position 2B, but also may entail, for bound material, more than twice the labor costs of position 2B because the volume must be shifted and repositioned under the camera lens after each exposure: after the recto of a page is filmed, the volume must be shifted to the right when the page is turned in order to film the verso, then to the left to film the recto of the next page, and so on.

The table in the lower part of figure 6 indicates the maximum recommended dimensions for material to be filmed in any one of the four standard positions, as well as the maximum recommended reductions for two ranges of type size; interpolations can be made for sizes not given. To use the table, determine the page height, width, and approximate type size of the material to be filmed; then, using the position chart in conjunction with the table, determine whether the material can be filmed in position 2A, or whether 2B or even 1A will be necessary.

For languages reading from right to left and for other variations from the usual Western language arrangement, the page shall be positioned to allow for the normal and logical progression of pages (see figure 7). This is accomplished by positioning the camera head so that progression of exposed film shall reflect the progression of text.

The actual reduction ratio chosen shall make the best practical use of the available film width to achieve the maximum legibility of the image. The maximum permissible width for the latter on 35mm unperforated film is 1.3 inches (33.020mm). This "permissible image width" is an important factor and must not be disregarded in making preparation for filming. An example follows: The chart and table indicate that a book 10 inches (254.00mm) high and 13 inches (330.20mm) wide (across a double-page opening) with type size of average height (2mm lower case "e", or 0.0787 inch) and good legibility, may be microfilmed in position 2A with a *maximum* reduction ratio of 20 diameters. A warning is hereby sounded, however, by emphasizing that the reduction ratios indicated in the table are maximums. These ratios must not be applied mechanically without due consideration of other factors, especially the "permissible width" dimension already noted. If the 20x specification is used for a volume with the dimensions cited, the results may be unsatisfactory: the double-page width of 13 inches reduced 20 times will produce an image width (dimension A) of 13/20 inch (16.51mm), or only half the permissible image width of 1.3 inches (33.020mm). To achieve the correct "mix" of dimension, legibility, and economy, a lower reduction ratio, around 14x, must here be used to fill up the frame, thus avoiding the waste of an undue amount of usable film along both edges, and to achieve superior legibility by using all the film area available.

If provision is to be made for the possibility of printing positive copies on *perforated* film, a reduction ratio of about 16 diameters in position 1A would be required, since the maximum permissible image width for perforated 35mm film is 0.944 inch (23.980mm).

The intended use of the negative may dictate the position as well as the reduction ratio. If other institutions or concerns will be making further reproductions, it is important to obtain their recommendations for reduction ratios and image placement before beginning the filming.

Material such as inserts and fold-outs the same size or smaller than the double-page spread of the volume in question, in which the type size and legibility are comparable to the text, shall be filmed at the same reduction ratio as the rest of the book. Where type size is smaller and legibility inferior, lower reduction ratios are indicated. Inserts and fold-outs too large to meet the specifications indicated in figure 6 must be filmed in sections, from left to right and from top to bottom as shown in figure 8. An overlap of at least one inch (25.400mm) shall be provided between adjacent sections, and the reduction ratio used shall allow for the desired number of sections with the proper overlap.

Filming shall normally be done at 14 to 20 diameters reduction, although ratios up to 24x may be used to avoid position 1A, type size permitting. For a discussion of the quality index method of determining reduction ratios, consult *NMA Standard. MS104-1972. Inspection and Quality Control of First Generation Silver Halide Microfilm. NMA. Silver Spring [Md.] 1972*, pages 19, 21, 25-26, and figure 34.

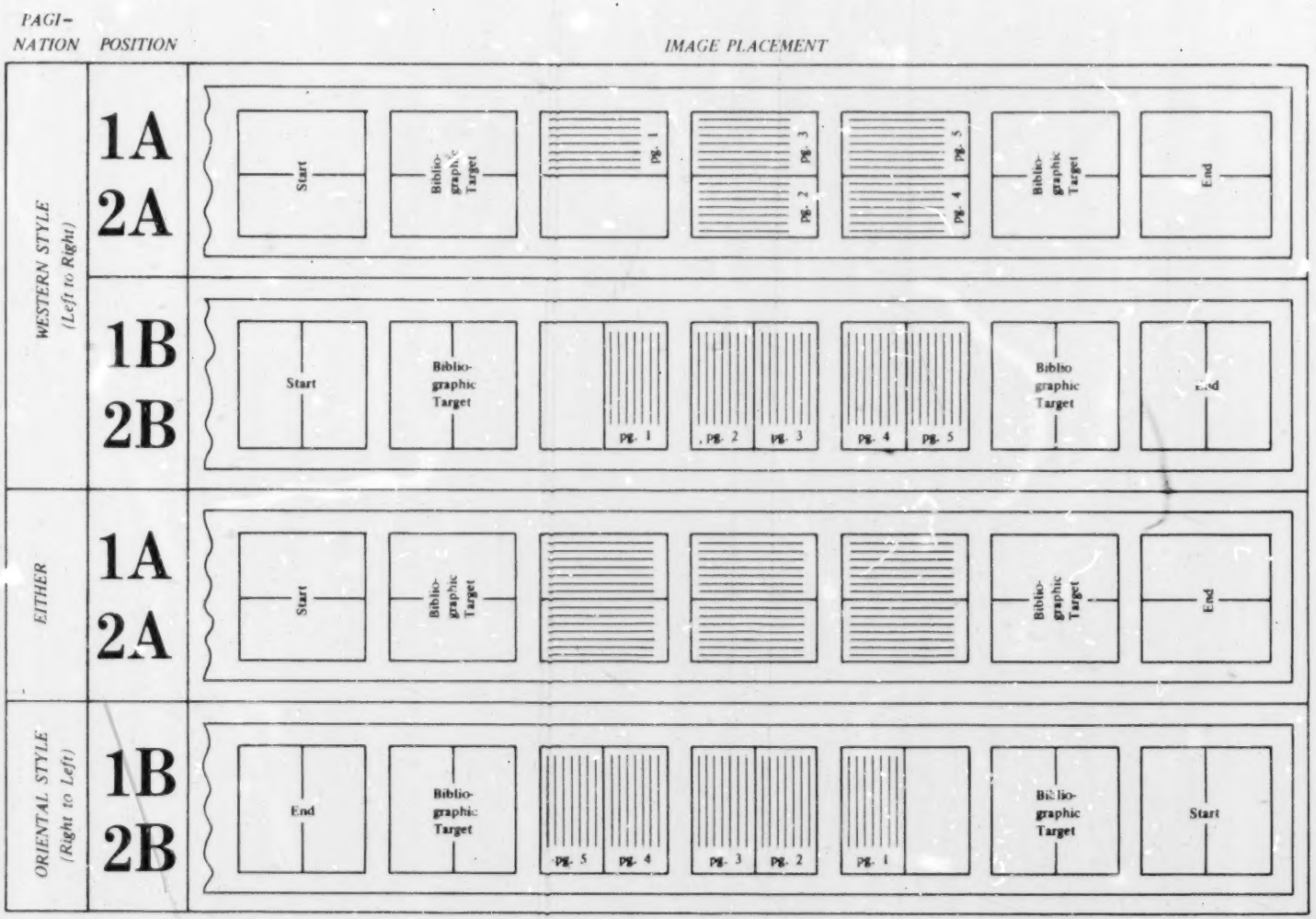


Figure 7 FILMING POSITIONS FOR PUBLICATIONS IN ORIENTAL STYLE VS. WESTERN STYLE

2.4 Film Stock

Use only safety microfilm stock as defined by *American Standard Specifications for Safety Photographic Film, PH1.25-1965*, or the latest revision thereof. Such film generally bears the legend "safety" along its outer edges. Microfilm intended for permanent preservation shall be made with film stock which meets the *American National Standard Specifications for Photographic Film for Archival Records, Silver-Gelatin Type on Cellulose Ester Base, PH1.28-1969*, or the latest revision thereof.

The negative film emulsion must be capable of resolving 400 lines per millimeter.

Unperforated film shall be used if at all possible; perforated film may be used only when the particular application makes it necessary.

Dimensions of the film, processed and unprocessed, shall meet the specifications set forth in *USA Standard Specifications for 16mm and 35mm Silver-Gelatin Microfilms for Reel Applications, PH5.3-1967, Section 4*, or the latest revision thereof.

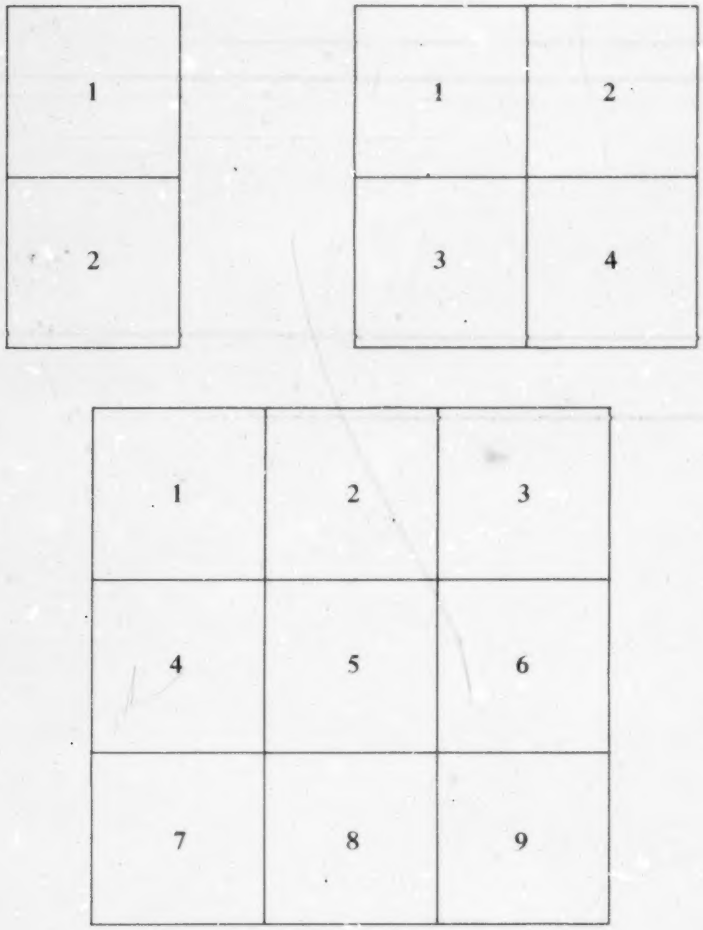


Figure 8

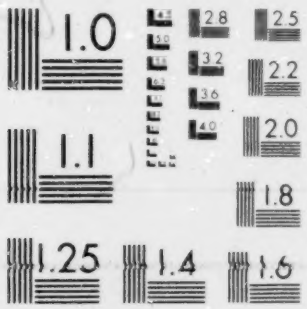
3. FILMING PROCEDURES

Only a qualified microphotographer may perform the actual filming of library material. The camera and base support must be rigid, since any vibration will blur the film images, and the area in which the filming is done must be as free of dust as possible.

The film produced shall resolve at least the NBS 7.1 line pattern in the corners of the image at a reduction ratio of 15x (see figure 9 for more detail). In determining the resolving power of the film system, the microcopy resolution test charts available from the National Bureau of Standards or the *mire* of the International Organization for Standardization shall be used; these provide sets of precisely spaced lines of varying widths (see figure 10). The test chart shall be photographed at a predetermined reduction ratio, with a background density of 1.2 to 1.8 as measured on a densitometer. After processing, the film shall be examined under a microscope (not with a reading machine) and a visual determination made of the most closely spaced set of lines which can be identified as separate and distinct. This reading multiplied by the reduction ratio will give the resolving power of the system in lines per millimeter. For example, if the resolution test chart is filmed at 20 diameters reduction, and the most closely spaced set of lines which can be distinguished as separate is that spaced at 5.6 lines per millimeter on the chart, the resolving power of the system is 20 x 5.6, or 112 lines per millimeter.

The film image shall be of sufficient contrast to permit easy reading and reproduction. Unless a differ-

Figure 9



Microcopy Resolution Test Chart-1010

NATIONAL BUREAU OF STANDARDS-1963-A

NBS/ISO Correlation Table *

REDUCTION SCALE	ISO CHARACTER SIZE			NBS PATTERN NUMBER Numbers of line pairs per millimeter		
	1st Generation	2nd Generation	Distribution	1st Generation	2nd Generation	Distribution
1:30	90	100	112	4.5	4.0	3.6
1:24	80	90	100	5.0	4.5	4.0
1:21.2	70	80	90	5.6	5.0	4.5
1:16;1:15	56	63	70	7.1	6.3	5.6
1.12;1:10.6 1/9	45	50	56	9.0	8.0	7.1
1:7.5	35	40	45	11.0	10.0	9.0

**When the National Bureau of Standards "Microcopy Resolution Test Chart" (above) is used, the pattern numbers in this table corresponding to the ISO character size (see figure 10) will give approximately the same legibility.*

Note: To obtain valid results, the test charts themselves must be used. Do not use the facsimiles in figures 9 and 10 for making tests.

ent background density is required to produce contrast, the material to be filmed shall be lighted so that images on the camera negative normally will have a background density range of 1.0 to 1.4, with the minimum possible variation in any one frame as measured by a densitometer. To obtain correct exposure and a uniform density, exposure tests shall be made at the reduction ratio to be used in the filming in order to establish the level of reflected light (as determined by the light meter reading) that will produce images of a density within the required range. The intensity of the light source used shall be variable, with control by means of a rheostat or other similar device. During the filming, frequent light meter readings shall be taken, particularly when the color or shading of the paper changes noticeably, and the light intensity adjusted as necessary to maintain the same light meter reading. If the reduction ratio is changed significantly, new exposure tests shall be made because, even at the same light meter reading, the amount of light reaching the film is different at various reduction ratios. The lighting shall be kept balanced at all times to ensure uniform exposure of the entire frame; when one lamp burns out, all shall be rebalanced to achieve the specified illumination. Standard filters may be used to compensate for colored inks, colored paper, or stains in the original material. The density range within an exposure shall not exceed .05.

Showthrough in bound originals printed on one side only shall be eliminated or reduced as far as possible by backing each page with a white opaque sheet of paper or cardboard. Showthrough in originals printed on both sides can be reduced or eliminated entirely by backing the page with a dark sheet of paper.

In turning the pages, the operator shall be certain that all page movement has stopped before the next exposure is made. To ensure that all parts of the image are in focus, both sides of a bound volume shall be level. An adjustable book cradle is normally used to keep the material flat and within the field of focus at all times. Photographic glass which is free of distortions may be used to hold pages flat; hands shall not be used, since they detract from the appearance of the image.

Take care to keep the material properly aligned with the camera lens and film edges through frequent use of the finder light or by aligning the material with the guide marks on the copy bed.

The reel must not be overloaded; i.e., the film shall not be wound closer than 1/4 inch (6.350mm) to the outer edge of the reel, and in no case shall it exceed the diameter of the reel itself. Film shall be wound with the "START" target at the outer end.

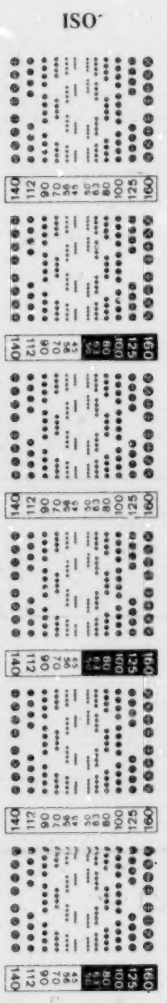


Figure 10

4. PROCESSING THE EXPOSED FILM

Exposed film shall be developed with an organic developing agent such as metol, hydroquinone, or glycin, compounded to produce a silver image essentially black; fixed in a thiosulfate bath; and finally washed with water to remove residual hypo (thiosulfate). Do not use so-called hypo eliminators and developers designed to produce stained or colored images. The residual hypo content of the processed film shall agree with the terms of the *American National Standard Methylene Blue Method for Measuring Thiosulfate and Silver Densitometric Method for Measuring Residual Chemicals in Films, Plates, and Papers, PR4.8-1971,* or the latest revision thereof.

5. INSPECTION OF THE FILM

Inspect all processed film, whether positive or negative, as soon as possible after processing has been completed. If this is not feasible, make at least a preliminary check for obvious defects resulting from faults or processing flaws, to prevent any similar defects in succeeding reels.

Extreme care must be exercised during inspection, to ensure that the film is not scratched. Either a hand magnifying glass (loupe) or reading machines which have been carefully inspected to make certain that the film in motion does not make contact with the glass flats which hold it in place for reading or printing may be used. Other reading machines may be employed but only with extreme caution; a sample reel shall be tested first on the machine to make sure that the glass flats are not in contact with the image area while the film is in motion.

Inspect negative film frame by frame to determine that all volumes or parts (if more than one), pages, and targets are included and filmed in the proper order, that the images are properly aligned, and that the individual image is clear, sharp, and uniformly lighted. The background density shall be routinely checked visually, and double-checked every few feet with a densitometer. Background density shall normally be between 1.0 and 1.4, although particular applications may require heavier or lighter densities.

Pages improperly filmed shall be refilmed, together with the page preceding and the page following, in such a way that a 2-inch (50.800mm) space be allowed for splicing before and after the remake which shall consist of at least 1 foot (304.80mm) of images. The remade film shall be inspected and spliced in place of the faulty film. In the finished film, the first frame in the spliced strip will be a duplicate of the frame immediately preceding the first splice; a corresponding duplication will occur at the second splice. This arrangement ensures at each splice point one good frame unaffected by the splicing process.

Heat-weld, butt-end splices are generally stronger and less bulky than other types and will cause less trouble in printing satisfactory copies. If cemented splices are used, the cement must not contain acetic acid or other chemicals injurious to the long-term storage qualities of the film. Cellophane tape and tape of the pressure-sensitive type shall not be used.

Every effort shall be made to keep the number of splices to the minimum. Since they are potential sources of trouble when microfilm is used in reading machines, all necessary splices shall be made in the negative copy before any positive copies are printed. Splices shall not be made merely for the economy of using short ends of unexposed film.

For further discussion of inspection procedures, consult *NMA Standard. MS104-1972. Inspection and Quality Control of First Generation Silver Halide Microfilm* (see section 10, Selected References)

6. INTERMEDIATE COPIES

Intermediate copies are used only to print many distribution (release or research) copies. The background density of a silver, second generation negative shall conform to the values listed in Appendix A.

7. RESEARCH USE COPIES

7.1 Film Intended for the Collections of the Library of Congress

Research use copies, generally positive, which are intended for the permanent collections of the Library shall be made on a contact printer with film stock meeting the specifications of *American National Standard Specifications for Photographic Film for Archival Records, Silver-Gelatin Type on Cellulose Ester Base, PH1.28-1969,* or the latest revision thereof.

7.2 Film Specifications and Processing

Research use film must be capable of resolving at least 400 lines per millimeter.

The exposed reference film shall be processed as indicated above (see section 4) and must meet the standard for density as shown in Appendix A.

7.3 Characteristics of Research Use Films

Research use film must be without splices and have at least 18 inches (457.20mm) of leader and 18 inches of trailer.

7.4 Library of Congress Criteria for Use in Planning Film Purchases

In purchasing research use film, the Library of Congress will test it, at least on a sampling basis, for acceptable bibliographical and technical quality. Satisfactory legibility must be uniformly present.

Safety-base film generally has the word "safety" at intervals along its outer edges. When in doubt, technicians shall test the film under procedures set forth in *American Standard Specifications for Safety Photographic Film, PH1.25-1965,* or the latest revision thereof.

Determine the residual hypo content in accordance with the *American National Standard Methylene Blue Method for Measuring Thiosulfate and Silver Densitometric Method for Measuring Residual Chemicals in Films, Plates, and Papers, PH4.8-1973,* or the latest revision thereof. Residual hypo shall not exceed 1.00 microgram/cm^2 as stated in *American National Standard Specifications for Photographic Film for Archival Records, Silver-Gelatin Type, on Cellulose Ester Base, PH1.28-1969,* or the latest revision thereof.

The technical and bibliographical quality of the film shall be in conformity with the practices outlined in sections 1, 2, and 4 above.

Since each successive generation of microfilm involves some loss of image quality, the Library of Congress shall include among other criteria in film evaluation for purchase an exact determination of the number of generations which separate the film under consideration from the camera negative.

8. STORAGE

Conditions for the storage of library microfilm shall approach, as nearly as possible, the specifications set forth in the *American Standard Practice for Storage of Processed Silver-Gelatin Microfilm, PH5.4-1970,* or the latest revision thereof, on reels made to the specifications of the *USA Standard Dimensions for 100-foot Reels for Processed 16mm and 35mm Microfilm, PH5.6-1968,* or the latest revision thereof.

Containers shall open easily and be made of durable material free from chemicals harmful to the film. Outer dimensions of the containers shall not exceed 4 inches (101.600mm) by 4 inches by 1 9/16 inches (39.687mm) for 35mm film. Each container shall bear a label on one end showing as much information from the bibliographical target as possible without crowding the label. If the reel is part of a set, the label shall also give the reel number and an indication of the contents of that particular reel (inclusive dates, volumes, etc.).

Rubber bands shall not be used on microfilm reels; strips of paper free from chemicals harmful to the film and furnished with strong string ties are recommended for holding the microfilm on the reels. Care shall be taken not to wind the film too tightly on the reel, since scratches on the film are likely to result.

9. Glossary

The terms listed below are defined only as they are used in the production of 35mm microfilm for library use. No attempt is made to provide comprehensive definitions covering all usages of particular terms in the larger fields of photography or optics.

Definition (Photo). That quality of a photo image concerned with clarity or sharpness of detail.

Densitometer. An instrument for measuring optical density. Two basic types exist:

1) Transmission—used to measure the opacity of film images.

2) Reflection—used to measure the amount of light reflected by a surface.

Density. The light-absorbing quality of a photographic image, usually expressed as the common logarithm of the ratio of the amount of light striking the image to the amount of light passing through the image. Several specific types of density values for a photograph may be expressed, but diffuse transmission density is of greatest use in the case of microfilm, and diffuse reflection density is generally of interest for prints.

Density, Background. The density of the noninformational area in a microfilm image.

Diameters. Reduction, Enlargement, or Magnification. A measure of the number of times a given linear dimension of an object is reduced or enlarged by an optical system. See *Reduction ratio.*

Emulsion. The light-sensitive coating on microfilm, usually containing silver salts and other chemicals suspended in gelatin.

Exposure. 1) The act of exposing a light-sensitive material to a light source.

2) A section of a film containing an individual "frame" or image, as in "a roll containing six exposures."

3) Loosely, exposure time; i.e., the time during which a light-sensitive surface is exposed to a light source; as in "an exposure of two seconds."

4) The product of light intensity and the time during which it acts on photosensitive material.

Finder light. A light beam projected from some cameras to show the outline of the photographic field at a particular reduction ratio. This field is sometimes further delineated by reticular lines and other guide marks.

Flats. Pieces of smooth, flat optical glass designed to hold microfilm in place for reading or printing.

Focus. 1) The plane in which rays of light reflected from a surface converge to form the sharpest possible image of the original after passing through the several parts of a lens.

2) To adjust the relative positions of the lens and film to obtain the sharpest possible image.

Frame. The area of film exposed to light through the camera optical system during one exposure, regardless of whether or not the area is filled by the document image.

Generation. A measure of the remoteness of a particular copy from the original material. The picture taken of a document, cathode ray tube, etc., is termed first generation microfilm (camera microfilm). Copies made from this first generation are second generation, and copies from the second generation are third generation, etc. First generation, negative appearing microfilm is designated "1N" and second generation, positive appearing microfilm is designated "2P," etc. (see Appendix A).

Gutter. The combined marginal space formed by the two inner margins of the facing pages of a book.

Hypo. Sodium or ammonium thiosulfate used in fixing baths to remove unexposed silver halides from silver emulsion film; also applied to the complete fixing bath, which may contain other chemicals.

Image. 1) A reproduction of an object, produced by light rays.

2) A photographic reproduction of an object on film.

Intermediate (copy). A reproducible, which may be microfilm, made from the original document. Used to make additional copies.

Leader. A strip of blank film at the beginning of a roll; used for the threading of a camera, projector, or processor.

Master film. Any film, but generally a negative, used solely for making copies, as opposed to film which

may be used in readers.

Microfilm. Fine-grain, fine-resolution photographic film carrying, or designed to carry, photographic images greatly reduced in size and usually too small to be read by the unaided eye.

Negative. A microfilm or microfilm image in which the tonal values are reversed from those in the original: light areas are recorded as dark, and dark areas, as light.

Perforated film. Film containing rectangular, evenly spaced sprocket holes, parallel and close to one or both edges of the film.

Positive. A microfilm or microfilm image in which the tonal values are the same as in the original: light areas are recorded as light, and dark areas, as dark.

Processing. The chemical or physical treatment of exposed photographic material to make visible the latent image; i.e., a series of steps consisting of developing, fixing, washing, and drying.

Reader. A self-contained device combining a projector and screen, used for viewing enlarged micro-images with the naked eye.

Reduction ratio. The ratio of a linear dimension of the original document to the corresponding dimension of the image on the microfilm, expressed as 14:1, 20:1, etc., or as 14x, 20x, etc.

Reel. A flanged holder for film, usually for processed film (as opposed to a spool, for unprocessed film).

Reference use (service) copy. Any film, generally a positive, supplied to readers for use in a reading apparatus or reader-printer.

Residual hypo. Sodium or ammonium thiosulfate (hypo) remaining in film or paper after washing. Since residual hypo has a deleterious effect and reduces film life, careful control must be maintained in processing to ensure that permissible limits are not exceeded.

Resolving power. The degree to which a lens is able to produce, or a film emulsion to record, fine detail in a micro-image, expressed as the number of lines per millimeter discernible in the image.

Splice. A joint made by cementing or welding (heat splicing) together two pieces of film or paper so that they will function as a single piece when passing through a camera, processing machine, projector, or other apparatus. In cemented splices, known as lap splices, one piece overlaps the other. Most welds are called butt splices because the two pieces are butted together without any overlap; some butt splices also use tape.

Target. 1) Any document or chart containing identification information, coding, or test charts.

2) An aid to technical or bibliographic control which is photographed on the film preceding or following the document proper.

Trailer. A strip of blank film at the end of a roll of film.

10. SELECTED REFERENCES

Ballou, Hubbard W., *ed. Guide to Microreproduction Equipment.* Annapolis, National Microfilm Association (latest edition and/or supplement).

Hawken, William R. *Copying Methods Manual.* Chicago, American Library Association, Library Technology Program, 1966.

National Microfilm Association. *Glossary of Terms for Microphotography.* Annapolis, [National Microfilm Association] 1966, or the latest edition thereof.

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Veaner, Alan B. *The Evaluation of Micropublications. A Handbook for Librarians.* Chicago, American Library Association, Library Technology Program, 1971 (LTP pub. no. 17).

11. APPENDIX A

The density of the background of the document image area shall be as listed below. The densities of silver films shall be visual diffuse transmission density.

Generation	Density Range
1N	1.0 to 1.4
2P	0.04 to 1.20
2N	1.0 to 1.4
3P	0.04 to 0.20
3N	0.90 to 1.5*

* The tolerance on distribution copy is always larger because of the variables which add up through the generations.

U.S. GOVERNMENT PRINTING OFFICE : 1973 O—507—911